RISK: Health, Safety & Environment (1990-2002)

Volume 7 | Number 1 Article 8

January 1996

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Environmental Racism and Biased Methods of Risk Assessment

Daniel C. Wigley & Kristin S. Shrader-Frechette*

In 1982, Reverend Benjamin Chavis, executive director of the United Church of Christ Commission for Racial Justice (CRJ) was arrested for blocking the path of trucks carrying toxic PCBs to a newly designated hazardous-waste landfill near a small southern town of predominately black residents. In 1987, a milestone CRJ report showed that the most significant determining factor in the siting of hazardous waste facilities, nationwide, was race. Also, a National Law Journal article concluded that the Environmental Protection Agency (EPA) took 20% longer to identify Superfund sites in minority communities and that polluters of those neighborhoods paid fines 50% as large as polluters of white communities.[1]

Introduction

Many studies support the CRJ conclusions. U.S. minorities disadvantaged in terms of education, income and occupation bear a disproportionate environmental risk.[2] Socioeconomically deprived

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1 Jonathan King, *A Place at the Table,* Sierra 78, June 1993, at 51-58 and 90-91. *See also,* Race and the Incidence of Environmental Hazards: A Time for Discourse (Bunyan Bryant & Paul Mohai eds. 1992) and Rae Zimmerman, *Social Equity and Environmental Risk,* 13 Risk Anal. 649 (1993); *see* The National Law Journal, *Special Issue: Unequal Protection: The Racial Divide in Environmental Law,* Sept. 21, 1992 and United Church of Christ, Commission for Racial Justice, Toxic Wastes and Race in the United States: A National Report on the Racial and Socioeconomic Characteristics of Communities with Hazardous Waste Sites (1987).

groups are more likely than affluent whites to live near polluting facilities,[3] eat contaminated fish[4] and be employed at risky occupations.[5] Because minorities are statistically more likely to be economically disadvantaged, many researchers assert that "environmental racism" — racial bias in imposing environmental threats — is the central cause of disparities in risks that minorities face.[6] Indeed, some have argued that race is an independent factor, not reducible to socioeconomic status, in predicting the distribution of air pollution, contaminated fish consumption, municipal landfills and incinerators, abandoned toxic waste dumps and lead poisoning in children.[7] Yet, whether race or socioeconomic status is the main cause of such inequities is still debated. Because they are more likely to be

2 Robert D. Bullard, Dumping in Dixie: Race, Class, and Environmental Quality (1990); Confronting Environmental Racism: Voices from the Grassroots (Robert D. Bullard ed. 1993); Unequal Protection: Environmental Justice and Communities of Color (Robert D. Bullard ed. 1994) and U.S. Environmental Protection Agency, Environmental Equity: Reducing Risks for All Communities (1992).

3 *See* Jay M. Gould, Quality of Life in American Neighborhoods, Levels of Affluence, Toxic Waste, and Cancer Mortality in Residential Zip Code Areas (1986); Toxic Wastes and Race, *supra;* Dumping in Dixie *supra* and Benjamin A. Goldman, The Truth about Where You Live: An Atlas for Action on Toxins and Mortality (1991).

4 *See* Race and the Incidence of Environmental Hazards, *supra* note 1 and Rebecca L. Calderon et al., *Health Risks from Contaminated Water: Do Class and Race Matter?* 9 Toxicol. Ind. Health 879 (1993).

5 *See* Environmental Equity; *supra* note 2; Marion Moses, Eric S. Johnson & W. Kent Angler, *Environmental Equity and Pesticide Exposure,* 9 Toxicol. Ind. Health 913 (1993) and Ken Sexton, Jenneth Liden & Barry L. Johnson, *"Environmental Justice": The Central Role of Research in Establishing a Credible Scientific Foundation for Informed Decision Making,* 9 Toxicol. Ind. Health 686 (1993).

6 Robert D. Bullard, *Environmental Racism in America?* 206 Envt'l Prot. 25 (1991); Robert D. Bullard & Beverly H. Wright, *The Politics of Pollution: Implications for the Black Community,* XLVII Phylon 71 (1986); Robert D. Bullard & Beverly H. Wright, *Environmentalism and the Politics of Equity: Emergent Trends in the Black Community,* 12 Mid-Am. Rev. Sociol. 21 (1987) and Dick Russell, *Environmental Racism: Minority Communities and Their Battle against Toxics,* The Amicus Journal, Spr. 1989, at 22.

7 *See* Robert D. Bullard, *Anatomy of Environmental Racism and the Environmental Justice Movement,* in Confronting Environmental Racism, *supra* note 2, at 21.

poor, minorities are also more likely to be politically disenfranchised. Thus, they are typically less able to fight unwanted risks. This disability could explain the disproportionate share of environmental threats that minorities appear to bear. It is not necessary, however, to settle whether race or socioeconomic status is a greater cause of environmental inequities. Regardless of the precise cause, there is evidence of racist bias in environmental decisionmaking, as this essay shows.

Because there is growing national concern that disparities in environmental and health risks are related to race and socioeconomic status, preventing environmental racism and promoting environmental justice is now a top priority on the public health agenda of the U.S.[8] Environmental justice is the attempt to accord all people — regardless of their race, ethnicity, class, age or gender — equal protection and equal opportunity in matters of environmental degradation and resource consumption. On Earth Day, 1993, President Clinton announced a federal action plan to achieve environmental justice for all Americans. On February 11, 1994, he signed Executive Order 12898 that directs each federal agency to develop an environmental justice strategy for "identifying and addressing... disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."[9]

Here we argue that environmental injustice and racism occur not only when policymakers violate minorities' rights to free informed consent or equal treatment in siting decisions but also when risk assessors use biased scientific methods whose policy consequences de facto result in unjustified discrimination against people of color and

8 *See* Environmental Equity; *supra* note 2; Stephen C. Jones, *EPA Targets 'Environmental Racism,'* The National Law Journal Aug. 9, 1993, at 8; Paul Cotton, *Pollution and Poverty Overlap Becomes Issue, Administration Promises Action,* 271 J.AMA 967 (1994); John H. Cushman, Jr., *Clinton to Order Effort to Make Pollution Fairer,* The New York Times, Feb. 10 1994, at A1; Marianne Lavelle, *EPA Responds to Concerns of Minorities on Cleanups,* The National Law Journal, May 9, 1994, at A12 and Bud Ward, *Environmental Racism Becomes Key Clinton EPA Focus,* 149 Safety & Health 183 (1994).

9 Executive Order 12898, § 1-101(reprinted Environment, May 1994, at 16).

socioeconomically disadvantaged groups. We support our claim by presenting a case study of the recently proposed Claiborne Enrichment Center (CEC), a uranium enrichment facility near Homer, Louisiana. We show that the Nuclear Regulatory Commission's (NRC's) Final Environmental Impact Statement (EIS) for the CEC is seriously flawed in its general scientific methodology and logic. In our view, the agency's EIS: provides inadequate arguments both for the plant and for siting the polluting facility in a poor black community; does not sufficiently explore other, less dangerous, energy alternatives; gives no reasonable justification for eliminating potential alternative sites in more affluent areas; improperly implements its own criteria for selecting an appropriate host community; uses biased accident evaluations that underestimate risks imposed on the black community; minimizes and misrepresents normal operating risks of the CEC; and underestimates costs and overestimates benefits. Because the EIS suffers from serious methodological and logical inadequacies, using it as the basis for siting is not justified. Moreover, we argue that risk assessors are neither innocent nor ignorant of the fact that the flawed EIS encourages imposing inequitable risk on socioeconomically disadvantaged communities. As a result, using the methodologically biased EIS appears to encourage unjustified discrimination against people of color.

Assessing the Risks of the Louisiana Facility

In January 1991, Louisiana Energy Services (LES) applied for a license to build and operate a uranium enrichment facility, the CEC, near Homer, Louisiana. The primary function of the proposed installation is to produce, during its 30-year life, various grades of enriched uranium for use in commercial nuclear power generating stations in the U.S. The NRC used LES data and methods on the proposed site to prepare an environmental impact statement for the plant. Assessors analyzed the projected environmental impacts, including potential health and safety risks, associated with the facility's construction, operation, decontamination, and decommissioning. The

EIS also discussed the purpose and need for the plant and the site-selection process.

What is the rationale for the facility?[10] According to LES, as of 1990, the DOE supplied approximately 89% of enriched uranium purchased in the U.S., while only 11% came from other suppliers. However, by 1996, LES projects that 60% of the national demand for enrichment services will be uncommitted to DOE suppliers and that, by the year 2000, this share will grow to 70%.[11] Owners of LES believe that the increasing (uncommitted) demand provides an opportunity for a competing company to enter the U.S. enrichment market. Furthermore, the EIS argues that the LES facility is likely to be an effective competitor, in part because the proposed plant will utilize the gas centrifuge technology, which uses about 50 times less electrical energy than the DOE's old gas diffusion technology.[12] In addition, LES owners claim that the CEC: (1) will pressure other U.S. enrichment suppliers to maintain competitive positions in the world market, (2) will reduce national dependence on foreign suppliers, and (3) will provide an opportunity to replace the older gas diffusion process with an energy-efficient one.[13]

After explaining the need for the CEC and presenting the site-selection process, the EIS gives a general description of the surrounding environment, including local communities' socioeconomic characteristics.[14] The projected site is in Claiborne Parish, a depressed area with a high percentage of minority residents. Its racial/ethnic composition is 53% white, 46% black and approximately 1% American Indian, Asian and Hispanic.[15] Percentages are roughly the same for Homer, a town in Claiborne Parish about five miles from the site. However, two small communities hosting the proposed plant,

10 U.S. Nuclear Regulatory Commission, 1 **Final Environmental Impact Statement for the Construction and Operation of Claiborne Enrichment Center, Homer, Louisiana** 1-5 – 1-9 (1994) (hereafter EIS).

11 1 EIS, at 1-5.

12 1 EIS, at 1-5.

13 1 EIS, at 4-77.

14 1 EIS, at 3-93.

15 1 EIS, at 3-103.

Center Springs and Forest Grove — about 0.25 and 1.25 miles, respectively, from the site — are almost entirely African-American.[16] The EIS also ranks the area among the poorest in the U.S.:[17]

> Employment in Claiborne Parish... is generally low-wage and low-skill. Per capita earnings for the residents is about $5,800 per year.... The average for the broadly defined LES labor market is only about $8,500 per year compared to the national average of almost $12,800. These figures, in particular the Claiborne Parish figures, makes it one of the poorest regions in the United States as measured by per capita earnings.

In terms of total per capita personal income, Louisiana is ranked 45th in the U.S., and Claiborne Parish is ranked in the bottom third of its parishes.[18] Unemployment in the Parish is 8%, with "minority unemployment" being "minimally 50% greater than white unemployment."[19] The high-school-dropout rate in Claiborne Parish is 47%.[20] Besides being among the poorest in the nation, Homer and the two black towns have both limited resources and fluctuating or rising crime rates. Because "budgetary constraints have imposed hiring freezes and have even resulted in the dismissal of police employees," law-enforcement resources have "come under strain" during periods of higher-than-average crime.[21] Like other parts of the country, the Homer area experiences "drug-related crime, including 'crack' cocaine dealing, and drug-related burglaries, thefts, and robberies."[22]

After describing the main socioeconomic characteristics of the proposed site, the EIS provides an assessment of the environmental

16 1 EIS, at *xxvi.*

17 1 EIS, at 3-109.

18 1 EIS, at 3-112.

19 1 EIS, at 3-110 & 3-111.

20 U.S. Nuclear Regulatory Commission, **Draft Environmental Impact Statement for the Construction and Operation of Claiborne Enrichment Center, Homer, Louisiana** xxiii (1993) (hereafter Draft EIS).

21 1 EIS, at 3-96.

22 1 EIS, at 3-96.

consequences of the facility for both normal operations and postulated accident conditions. Normal operation of the plant creates the potential for radiological and nonradiological impacts. According to the EIS, nonradiological impacts include, for example, increases in crime, higher rental and home-purchase prices, and contaminant releases of nonradiological substances to surface water, groundwater, and air.[23] Public radiological impacts of the CEC include atmospheric exposure (to uranium from the uranium enrichment process lines and equipment decontamination and maintenance), aquatic exposure (from radioactive liquids released to surface water), and direct exposure (from storage and transportation of UF_6 cylinders).[24] The NRC bases its assessment of radiological impacts, in part, on its review of similar enrichment plants and on evaluation methods established in its regulatory guidelines.[25] The EIS discussion of radiological impacts also includes a risk analysis. It explains that consequences from potential accidents "could include personal injury, health effects from acute exposure to toxic chemicals, non-stochastic effects from acute radiation exposure, and risk of latent cancer due to exposure to radioactive material."[26] The analytical procedures used in the CEC risk analysis involve "review of potential accident initiators and related release mechanisms" and "development of accident scenarios."[27] This identification of accident initiators and scenarios is based on review of past experience in European centrifuge plants, previous NRC-sponsored evaluations of accident scenarios, and LES's description of projected equipment and operations at the proposed facility.[28] Rather than a typical, probabilistic risk assessment, the accident evaluation in the EIS is of a "deterministic, non-probabilistic nature."[29]

23 *See* 1 EIS, at 4-19 – 4-32.
24 1 EIS, at 4-36.
25 1 EIS, at 4-37ff.
26 1 EIS, at 4-46.
27 1 EIS, at 4-46.
28 1 EIS, at 4-46.
29 1 EIS, at 4-46.

The EIS also presents a cost-benefit analysis. Benefits of the proposed CEC include gains in regional employment, primarily in the form of high-paying construction and operations jobs. Statewide gains would result from the multiplier effect of these new employment opportunities. The distribution of benefits, however, "is likely to be concentrated in the middle income groups," and higher-income households are expected to "benefit most from the income generation process."[30] Local costs of the CEC include overtaxing of community services and crowding of schools, hospitals or other public facilities. According to the EIS, the largest potential impacts are to come from local increases in crime, which will strain the police and justice systems.

Based on its evaluation of potential impacts from the facility, the EIS concludes that the construction and operation of the enrichment plant would not result in a significant impact on environment or human health and that siting the CEC would not impose an environmental injustice on poor minority communities. The EIS authors maintain that radiological and nonradiological impacts resulting from routine operations, as well as consequences of potential accidents, will be within limits set by the NRC and EPA.[31] In response to the 1994 U.S. Executive Order 12898, the NRC staff explicitly considered the issue of environmental justice from two perspectives: (1) "Is the evidence that LES selected the proposed CEC site based on racial considerations?" and (2) "Will minority and economically disadvantaged populations be disproportionately affected by the CEC?"[32] First, the EIS authors claim that, because LES used no explicit racial considerations in its site-selection process, this process violated no norms of environmental justice.[33] Although they admit that the CEC will affect those living closest to it the most, the NRC assessors project no significant environmental or health impacts as a result of the facility and conclude

30 1 EIS, at 4-78.

31 *See, e.g.*, 1 EIS, at 4-45, 4-60 & 4-61.

32 1 EIS, at 4-34.

33 1 EIS, at 4-35.

that "there will not be a disproportionate adverse impact on minority and low-income populations."[34] As a result, the NRC staff maintains that the proposed enrichment "facility is not an example of environmental injustice."[35] Indeed, based on its cost-benefit analysis, the EIS concludes that, "on balance, CEC should be a major socioeconomic asset to Homer, Claiborne Parish, and neighboring parishes."[36] If our arguments are correct, however, there may be reason to doubt these claims.

Inadequate Assessment Arguments Showing Need for the Facility

Under the National Environmental Policy Act (NEPA), the EIS must state the need for the proposed CEC. Yet, the discussion of need is inadequate. For one thing, contrary to LES officials' assertion that the facility will be a complementary supplier of enriched uranium, it may jeopardize both government enrichment income and customers.[37] The DOE and U.S. taxpayers now face the enormous costs of future decontamination and decommissioning of old enrichment facilities, environmental restoration of plant sites and deployment of new enrichment technology.[38] DOE customers could help taxpayers handle these costs. Yet, because the facility will be in direct competition with those of DOE (government) suppliers,[39] it could take customers away from the DOE. Hence, it could hinder the U.S. government's handling of future expenses related to enrichment.

Further, the current federal enrichment strategy (that includes privatizing the U.S. Enrichment Corporation and developing more cost-efficient technologies) may eliminate the need for the facility.[40]

34 1 EIS, at 4-35.

35 1 EIS, at 4-35.

36 1 EIS, at 4-86.

37 *See National Energy Strategy (Part 2). Hearings Before the Subcomm. on Energy and Power of the House Comm. on Energy and Commerce,* 102d Cong., 1st Sess. (1991); Energy Policy Act of 1992, P.L. 102-486, Oct. 24, 1992.

38 *See id.*

39 1 EIS, at 1-5.

The DOE is committed to the Uranium-Atomic Vapor Laser Isotope Separation (U-AVLIS) process. This means of enriching uranium costs 50% less than any other, including the centrifuge technology to be used at the proposed CEC.[41] Although the U.S. government has not yet proceeded with the commercialization of the U-AVLIS process, experts testifying before Congress have indicated that the new technology can be put in operation shortly after the year 2000 and in facilities whose output will be much greater than the proposed CEC.[42] In addition, the EIS acknowledges that "in 1993, the U.S. and Russia reached an agreement which provides for the U.S. to buy Russian uranium."[43] As the EIS admits, the uranium from dismantled Russian nuclear weapons will supply more than "50% of projected U.S. demand" during the first 15 years of CEC operation.[44] Given these U.S. strategies for addressing current enrichment problems, it is questionable whether there is a need for the proposed CEC facility.

The EIS also fails to show a need for the plant because it inadequately discusses the status of the declining U.S. nuclear power industry. A healthy nuclear industry is a necessary condition for building any enrichment facility. According to the EIS, LES has projected that requirements for enrichment services will begin to increase significantly in the year 2000.[45] This projected increase, however, is doubtful. The commercial reactor industry collapsed in the 1970s,[46] with the cessation or cancellation of all orders for new nuclear generating facilities. Although utilities ordered 231 fission plants through 1974, they canceled or indefinitely deferred all fifteen reactors ordered after 1974 and over 100 other plants already ordered or under

40 *See* Environmental Policy Act of 1992 §§ 1502 & 1601.

41 *See National Energy Strategy, supra* note 37, at 41-142.

42 *See id* at 151.

43 1 EIS, at 1-5.

44 1 EIS, at 1-7.

45 1 EIS, at 1-5.

46 *See, e.g.,* John L. Campbell, Collapse of an Industry: Nuclear Power and the Contradictions of U.S. Policy (1988).

construction. No utility has ordered a new nuclear plant since 1978, and virtually all U.S. commercial reactors now existing (or under construction) will have ended their 30-to-40-year lifetime by the year 2004 — before the proposed LES facility will be fully operational.[47]

The collapsed state of the commercial nuclear industry likely will continue because many problems that precipitated it show no real signs of being solved. Reasons for collapse include: (1) a sharp downturn in expected electricity demand; (2) increased reactor costs, brought about by inflation, extended construction times and unanticipated new regulatory requirements; (3) public opposition and (4) instances of poor management.[48] Another important factor that now hinders revival of the industry is DOE's uncertain progress in siting a permanent repository for high-level radioactive waste.[49] Utility officials believe that many such difficulties will persist, at least, until after the beginning of the next century.[50] In a 1990 report, the GAO interviewed no utility officials who were willing even to consider purchasing a new nuclear reactor before the beginning of the next century.[51] This reluctance to consider fission-generated electricity — primarily because of strong public opposition and high financial risks for utilities — is likely to continue.[52] Because of the current state of the U.S. nuclear industry and the alternative technological strategy for providing the nation's enrichment services, it is questionable whether there is a real need in the U.S. for the LES enrichment facility.

47 *See id,* at 3; U.S. General Accounting Office, **Electricity Supply: What Can Be Done to Revive the Nuclear Option? Report to the Chairman, Environment, Energy, and Natural Resources Subcommittee, Committee on Government Operations, House of Representatives** 10, 23 (1989).

48 *Id.,* at 14.

49 *See* Kristin S. Shrader-Frechette, **Burying Uncertainty** (1993); Nicholas Lenssen, *Confronting Nuclear Waste,* in State of the World 1992 (Lester R. Brown ed. 1992) and **Electricity Supply**, *supra* note 47, at 4.

50 *See* **Electricity Supply**, *supra* note 47, at 22–25.

51 U.S. General Accounting Office, **Nuclear Science: U.S. Electricity Needs and DOE's Civilian Reactor Development Program, Report to Congressional Requesters** 3 & 17(1990).

52 Lenssen, *supra* note 49.

Inadequate Exploration of Other Energy Alternatives

Although NEPA requires a detailed analysis of alternatives to any proposed facility,[53] the EIS provides no adequate discussion. The EIS could include investigations of the status of (1) alternative non-nuclear energy sources (e.g., solar, wind, geothermal); (2) other nuclear energy sources (e.g., thorium-232 fission reactors[54]); and (3) alternative enrichment technologies (e.g., U-AVLIS). It includes a very brief discussion of the U-AVLIS technology and, despite NEPA's requirement, dismisses the need to consider such alternatives:[55]

> The environmental review of a license application focuses on the proposal of the applicant and the goals of the applicant. In a licensing proceeding, therefore, the alternatives considered by the NRC must be connected to the applicant's stated goals. Thus, the EIS need not discuss the environmental effects of alternatives that are only remote and speculative possibilities or that would not accomplish the stated goals of the applicant.

The EIS states that the U-AVLIS "technology, when developed, could have both environmental and economic advantages." Nevertheless, the NRC accepts LES's rejection of the new technology because it is not yet commercially available and would require LES to construct other production facilities.[56] Also, regarding the DOE's plans for developing the U-AVLIS technology, LES claims that, "Until DOE demonstrates integrated systems reliability, decides on a deployment plan and it is approved by Congress, there is no basis for any comparison with the CEC."[57] That is, contrary to DOE claims, the NRC accepts the LES contention that the U-AVLIS technology is a remote and speculative possibility. The NRC also appears to give primacy to LES's proposed goals rather than to those of its own government.

53 1 EIS, at 1-1.

54 *See* Ivars Peterson, *Accelerator Route to Nuclear Energy,* Science News, Jan. 1, 1994, at 12.

55 2 EIS, at 1-259.

56 1 EIS, at 2-1.

57 Louisiana Energy Services, LES Project Financial Plan, Attachmt. D, at 8 (1992).

Contrary to the LES and NRC claims, it is arguable that the U-AVLIS technology is not a remote and speculative possibility and deserves more consideration in the EIS. In 1991, the same year in which LES applied for its license to build the CEC (to use the older technology) William H. Young, Assistant Secretary for Nuclear Energy, affirmed the newer U-AVLIS process. He confirmed that:[58]

> DOE's current technology demonstration efforts for the U-AVLIS process are fully funded and proceeding on schedule for completion in September 1992 to support these commercial decisions [regarding the technology's market introduction].

Young stated that "a small AVLIS plant with a capacity of about 3 million separative work units (SWU)" could provide "initial production in 1999."[59] Young also claimed that a larger plant could be built "with a capacity of about 9 million SWUs at a cost of about $1,050 million, in FY 1992 dollars, with initial production in 2000."[60] The dates for these newer-technology plants roughly correspond to the initial production times of the proposed older-technology CEC. Moreover, the fact that the DOE is not pursuing the outdated centrifuge technology (used in the CEC) is evidence to suggest that U-AVLIS is likely to be successful. Thus, even if the date for the U-AVLIS plants were pushed back a couple of years, the new enrichment technology would not be a remote and speculative possibility, unworthy of more serious consideration.

Second, contrary to claims in the EIS, detailed analyses of energy and enrichment alternatives may be relevant for assessing the stated goals of an applicant, like LES, even if such alternatives obviously are inappropriate to those aims. The applicant's goals are supposed to promote the public good, not merely the corporation's interests, and alternative projects may achieve this end better than an existing

58 *National Energy Strategy, supra* note 37, at 142.

59 *National Energy Strategy, supra* note 37, at 151.

60 *Id.*

proposal. Given NEPA's requirement to promote the general welfare, it is arguable that projects should be licensed only if they are in the public interest. In order to determine whether an applicant's goals promote the common good, the NRC should compare these aims with those of other potential projects that may employ alternative technologies. For example, although the U-AVLIS process may be inappropriate for accomplishing the particular commercial aims of LES, this enrichment alternative (and U.S. plans to utilize it) may make the LES project unnecessary. If so, then the CEC would not promote the public good because its siting would subject communities to unnecessary risks from an expensive and outdated technology.

Inadequate Justification for Eliminating Potential North Carolina Sites

Another problem with the Louisiana EIS is its methodologically questionable elimination of other potential areas for the site, particularly those located within North Carolina. The EIS used a three-phased site-screening process: (1) the identification of a candidate region; (2) the determination of potential areas for the facility; and (3) the selection of alternative locations.[61] However, this screening process presupposes that all parts of (all sites within) a region may be rejected simply because the region taken as a whole (most of the region) exhibits unacceptable characteristics. As a result, phase two of the EIS screening may have inappropriately excluded potential sites from consideration. This is questionable because what is mostly or generally true of a whole is not always true of its parts. The NRC authors seem to commit (what is known as) "the fallacy of division."[62] For example, to argue that because an automobile is poorly built, therefore every part of the automobile is poorly built, is to commit this fallacy. Similarly, the EIS commits this fallacy by excluding suitable North Carolina sites — merely because they were within a larger region where many sites were seismically unsuitable. Within North Carolina there is a large investor-

61 1 EIS, at 2-3.

62 *See* Irving M. Copi, **Introduction to Logic** 119 (7th Ed. 1986).

owned electric utility service area (i.e., Duke Power Co.). Although most of the area is in an unfavorable seismic zone, the EIS presents maps indicating that part of this utility area is within a low seismic zone (corresponding to earthquakes with an effective peak acceleration of less than $0.49 m/s^2$).[63] However, it states that the "North Carolina and South Carolina utility service areas were removed from consideration because the effective peak acceleration of earthquakes exceeded $0.49 m/s^2$."[64] It commits the fallacy of division and, without justification, the EIS may have rejected locations (with low minority populations) as seismically favorable as the chosen Louisiana site (within a high African-American population). The following comments by the NRC concerning the methodology of the screening process seem to confirm this fallacious, potentially racist, mode of reasoning:[65]

> The purpose of a regional screening is to select a region for more detailed review. It is acceptable to reject regions from further review based on broad criteria, even though there may be potential sites in the region that is rejected.

Similar fallacies occur in the EIS discussion of a favorable transportation region for siting the CEC. The analysis is biased in ignoring the fact that a North Carolina site is probably more suitable for transportation purposes. The EIS was able to claim that the Louisiana site was more desirable only because it ignored the facts that a raw material source in Oklahoma is no longer operational, and owners shut down one destination plant in Connecticut. Thus the Louisiana site looks favorable only because the transportation analysis in the EIS is seriously outdated.[66] The NRC authors acknowledge these two shutdowns but nevertheless accept LES's calculations that ignore the shutdowns and exclude potential North Carolina sites from the favorable transportation region. The EIS states that "The Oklahoma facility was operational when LES conducted its [draft] site selection.

63 *See* 1 EIS, at 2-5 (figure 2.1), 2-7 (figure 2.3) & 2-10 (figure 2.5).

64 1 EIS, at 2-8.

65 2 EIS, at 1-262.

66 1 EIS, at 2-4, 2-6.

The fact that the facility has since shut down does not invalidate the process."[67] NRC assessors make the questionable assumption that the final EIS need not be state-of-the-art. But updated calculations, excluding the facilities that are no longer operational, would result in EIS employment of a transportation region that includes the Duke Power Company's service area in North and South Carolina. This simple correction would make any potential site within the North Carolina service area more favorable (regarding transportation) than any location in Louisiana, because it would be much closer to several major product destination points. Yet the EIS justified the Louisiana site, with its high minority population, rather than a Carolinas site, with a potentially lower minority population.

Improper Implementation of Site-Selection Criteria

Environmental racism also appears to have influenced the EIS conclusions and methods because investigators did not properly implement their own criteria and procedures in the site-selection process. Although they chose the African-American communities, Center Springs and Forest Grove, to host the proposed CEC, assessors included them neither in the site-solicitation process nor in scoring and evaluation procedures. LES followed a three-phased screening process to identify a suitable site for the enrichment facility.[68] Investigators at each phase used a set of economic, technical, social and environmental criteria. The first phase, mentioned in the last section, identified geographical areas within the U.S. suitable for locating the plant. The second and third screening processes for the proposed CEC consisted of phases that focused on the selection of a final site in northern Louisiana. LES began by soliciting community leaders "for their interest in being the host site for a new manufacturing facility" and requested them to use LES's criteria to "nominate potential sites."[69]

67 2 EIS, at 1-262.

68 1 EIS, at 2-3 – 2-19.

69 1 EIS, at 2-11.

Twenty-one solicited groups sent offers to LES. LES eliminated some of these nominated communities through the use of additional criteria, such as the need for the host citizens to have a "strong manufacturing mentality."[70] LES then used a decisionmaking methodology of "musts" and "wants" to further narrow the list of potential locations.[71] Site "musts" included meeting certain geologic and soil requirements. Site "wants" included local support.[72] Investigators at this scoring phase of the second screening process chose Homer, a town in Claiborne Parish, Louisiana. In the final phase, LES researchers ranked potential sites around Homer and emphasized their "want" for community support and leadership regarding the proposed site.[73] They finally selected an area near Center Springs and Forest Grove, two African-American communities located five miles from Homer.

Despite LES's attributing great importance to local community support for the proposed facility, the site solicitation, scoring and evaluation procedures did not involve the host communities, Center Springs and Forest Grove, predominately black towns which are located approximately .25 miles and 1.25 miles, respectively, from the proposed CEC. EIS Investigators did not solicit opinion leaders from these two towns. Instead, assessors canvassed leaders from Homer (located 5 miles from the chosen site) and presented these officials with site-selection criteria that allowed them to nominate potential sites within other unsolicited communities. Thus, LES's criteria permitted site proposals that undermined the purpose of the solicitation process. Although the company's most important "wants" for evaluating potential sites included local citizens' acceptance and leadership, the site-selection process led LES's investigators to ignore the views of community leaders from Center Springs and Forest Grove.[74] Because

70 1 EIS, at 2-13.

71 1 EIS, at 2-12.

72 1 EIS, at 2-15.

73 1 EIS, at 2-18.

74 *See* 1 EIS, at 2-16, table 2.2. *See also* Robert D. Bullard, Commentator No. 5, in 2 EIS, at 1-20 and Robert D. Bullard, *Overcoming Racism in Environmental*

the LES authors did not take into consideration the opinions of the communities proposed as hosts of the plant, EIS investigators improperly implemented their own site-selection criteria and procedures. Indeed they used implementation criteria that appear to be evidence of environmental racism.

Biased Accident Evaluations That Underestimate Risks

Environmental racism also may play a role in the EIS's biased underestimation of accident risks associated with the proposed facility. The EIS allegation that the CEC poses no significant threat to public health and safety is highly questionable and likely minimizes the real accident risk for at least three reasons: (1) The assessors performed no probabilistic risk assessment (PRA). (2) They based their conclusions on largely subjective judgments formulated in purely qualitative language. (3) Assessors used outdated empirical studies to draw their conclusions. (4) They did not evaluate some worst-case accidents.

Regarding the first problem, NRC assessors admitted that their conclusion about low accident risks "was based on the proposed design of the facility" and "was of a deterministic, non-probabilistic nature."[75] Drawing safety conclusions on the basis of the intended design of a risky facility is highly questionable because assessors have not checked empirically the theorized risks. Also, because virtually nothing occurs with certainty but with some probability less than or close to one, and because assessors estimate virtually all technological hazards by means of PRA,[76] the deterministic evaluation (that accident risk at the facility is low) of the EIS is highly questionable. If analysts performed no PRA for the proposed CEC, then for any potential accident, it is impossible to know reliably the probability of its occurring. Hence, the EIS conclusion about low risks is unjustified. Given assessors' well established "overconfidence bias,"[77] especially in

Decisionmaking, Environment, May 1994, at 39.

75 1 EIS, at 4-46.

76 *See* Kristin S. Shrader-Frechette, **Risk and Rationality** (1991).

assessing various nuclear-related risks, there is reason to believe that the NRC underestimates the CEC risk.

Second, the NRC assessors likewise appear to have underestimated the facility risks by virtue of the fact that they use subjective and qualitative judgments to defend their conclusion about low risks. They claim, for example, that operator errors (associated with inadequate degassing of the lines) could result in dangerous "releases of relatively small magnitude,"[78] yet they give no probabilities for such accidents and no justification for the predicted range of possible quantities of materials that could be released. Instead, without citation, they say that "surveys... have reported negligible worker doses."[79] How much is "negligible?" Who did the surveys? Where were they published? Why did no one perform epidemiological studies? Likewise, the EIS assessors conclude that failure of containment in the centrifuges could result in "minor health and safety consequences,"[80] yet they provide no quantitative analysis of all relevant and probable accident pathways and consequences. Unless they provide a PRA, they beg the question when they claim that accident consequences are "minor." Similar instances of qualitative and subjective conclusions, including begging the question, occur throughout the EIS. On page 4-69, for example, the assessors claim that releases of contaminants to the site will "be minimized," but they give no specific level of contamination that they will avoid and note merely "that necessary measures will be taken to meet" established standards. Given that various types of operational monitoring of the site take place at a variety of intervals — such as once a month and semiannually — and given that LES must submit the results of its environmental monitoring program to the NRC for review only once every two years,[81] it appears possible that site operators will minimize

77 *See* Daniel Kahneman and Amos Tversky, *Subjective Probability,* in Judgment Under Uncertainty 46–47 (Daniel Kahneman, Paul Slovic & Amos Tversky eds. 1982); Burying Uncertainty, *supra* note 49, at 131 & 155-156.

78 1 EIS, at 4-53.

79 1 EIS, at 4-60.

80 1 EIS, at 4-53.

accident risks and consequences, in part because there are very few and only infrequent independent checks on facility operations.

Also, because of the largely qualitative (not quantitative), vague EIS discussion about taking measures to meet standards, it appears likely that the assessors minimized accident risks. Otherwise it would cite quantitative PRA data for risk levels and guarantee that operators would actually meet the standards. Instead assessors claim that unspecified steps "will be taken" to meet standards. The EIS likewise asserts: "design, controls, and administrative procedures will be utilized to minimize the possibility of accidental releases" of contaminants from the site.[82] Yet it provides no specific probabilistic guarantees of minimal releases. Hence, there is again reason to believe that the NRC underestimates accident risks, in part because its conclusions appear to be based on vague, qualitative judgments. One wonders whether an affluent white community would accept such assessments or whether it would hire an expensive lawyer to fight construction.

The NRC assessors — using LES data — very likely also underestimated CEC accident risks because they based their inductive conclusions about transportation risks and accident scenarios in part on old data, from 1977 and 1984.[83] Employing eighteen-year-old and eleven-year-old information, as a basis for predicting present and future risks, probably misses a variety of possible accident scenarios. More mishaps are likely to have occurred since those reported in the dated documents. Moreover, the EIS assessors ignored some catastrophic accident scenarios (and assumed they would never take place), merely because they had "never occurred" in 32 years of enrichment-facility experience and because there would be "redundant protection controls."[84] Even redundant protections, however, often fall victim to human error. Sixty to 90% of serious technological accidents

81 1 EIS, at 4-37.

82 1 EIS, at 4-70.

83 1 EIS, at 4-45 & 4-46.

84 1 EIS, at 4-54.

(according to the U.S. Office of Technology Assessment) typically involve human error. Also, an alleged accident rate of 0 in 32 years is not necessarily low but is consistent with a failure rate as high as 1 in 100 years, for example. As elementary considerations of confidence intervals shows, if the real probability of an accident were 1 in 100 per year, or 1 every 100 years, then the probability of going 32 years without an accident would be 72.5%. Yet, a risk of 1 in 100 is quite high, four orders of magnitude higher than federal officials often allow.[85] Indeed, such a rate would not support disclaimers about no "significant threat to public health and safety" from the facility.[86]

Perhaps the greatest source of underestimation of accident risks is failure to provide evaluations of some worst-case accidents. Worst-case scenarios likely would include autoclaves used in the feed, purification, sampling and blending sections of the facility. As the EIS states:[87]

> Mechanical damage or thermal over-pressurization and rupture of the feed cylinder and autoclave would produce the largest potential release to the atmosphere for accidents occurring inside the Separations Building.

In addition, the EIS claims:[88]

> The product sampling and blending systems utilize heated autoclaves to liquify enriched UF_6. Failure modes for these autoclaves would be similar to those hypothesized for the feed autoclaves. Major failure of a heated cylinder and the autoclave would release a large amount of UF_6 to the atmosphere.

Nevertheless, its authors admit that major "failure of the blending and sampling autoclaves is not evaluated in the accident analysis."[89] The EIS gives two reasons for ignoring this worst-case accident scenario:

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85 *See, e.g.,* U.S. Nuclear Regulatory Commission, Reactor Safety Study: An Assessment of Accident Risks in US Commercial Nuclear Power Plants (1975); Shrader-Frechette, **Risk and Rationality**, *supra* note 76, at 71.

86 1 EIS, at xxi.

87 1 EIS, at 4-53.

88 1 EIS, at 4-54.

89 1 EIS, at 4-54.

"major failure of a cylinder in an autoclave has never occurred with this type of autoclave," and "diverse, redundant protection controls" will be present.[90] But the fact that a major failure has never occurred tells us nothing about how likely it is to take place in the future. The mistake here seems to be that of confusing accident frequency with accident probability. Low accident frequency never confirms low accident probability. Accident frequency approaches accident probability only when the time period of observed accident frequencies nears infinity.[91] Furthermore, the presence of diverse, redundant protection controls, in accord with the NRC's "Advance Notice of Proposed Rulemaking design basis,"[92] does not show that an accident occurrence is unlikely. One must first establish the effectiveness of the protection controls, and this requires in part a detailed PRA — which assessors have not performed for the EIS. Similar objections also apply to the reasons given in the EIS for not evaluating possible major failures of the feed autoclaves. The EIS asserts that, "due to the presence of diverse, redundant protection systems, the event was not considered credible and is not analyzed in detail."[93] Thus, without sufficient justification, the qualitative, deterministic, question-begging conclusions provide neither an adequate analysis of worst-case accident scenarios nor the requisite PRA. Indeed, the deterministic analyses in the Louisiana EIS are typical of risk assessments performed in the 1950's and 60's. Since then, probabilistic assessments have become the standard. One wonders if an affluent white community would tolerate a facility whose EIS was deterministic and not based on state-of-the-art PRA.

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90 1 EIS, at 4-53.

91 **Risk and Rationality**, *supra* note 76, at 80-81.

92 1 EIS, at 4-53; U.S. Nuclear Regulatory Commission, Regulation of Uranium Enrichment Facilities, Advance Notice of Proposed Rulemaking, 53 Fed. Reg. 13,276 (1988).

93 1 EIS, at 4-53.

Biased Estimates of Normal Operating Risks

Besides underestimating accident risks and ignoring state-of-the-art PRA, the EIS also minimizes the health and safety impacts of the facility. The NRC notes, for example, that groundwater contamination is a possibility from the proposed plant.[94] Yet, the document provides almost no quantitative determination either of possible groundwater impacts or the associated risk probabilities and consequences. Nevertheless, the risk might be substantial. Ninety percent of the 127 U.S. government (DOE) nuclear-related facilities have contaminated groundwater that exceeds regulatory standards up to 1,000 times. Virtually every state (in which a nuclear-related facility exists) has criticized the federal government for not stopping health and safety violations and for failure to obtain independent site monitoring.[95] Hence, U.S. experience with nuclear facilities suggests both that the groundwater risk at the proposed CEC could be quite high, and consequently that the qualitative EIS judgments very likely underestimate. EIS authors comment that the potential impacts of expected groundwater releases are "insignificant" in part because of "the low solubility of uranium in water."[96] But this falsely assumes that only soluble uranium poses groundwater contamination risk. Because assessors did no PRA and ignored the probabilistic groundwater risk, they drew vague, qualitative conclusions about its low magnitude and therefore appear to have underestimated another real risk of the facility.

Assessors likewise claim that they expect "minimal" releases of radioactive waste during decontamination of the facility,[97] yet the EIS provides a PRA and a quantitative determination neither of this risk nor its associated probabilities and consequences. Indeed, although there is some European experience with decommissioning plants like the CEC,[98] no one in the U.S. has ever accomplished full decontam-

94 1 EIS, at 4-72.

95 Burying Uncertainty, *supra* note 49, at 155.

96 2 EIS, at 1-267.

97 1 EIS, at 4-74.

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ination of an enrichment facility. As a result, positing low risks is largely hypothetical. One important indicator that the alleged decontamination risks for the CEC could be substantial is the fact that the EIS estimates the cost of decontamination at $518 million.[99] Other independent experts, estimating the cost of decontamination for existing U.S. enrichment facilities, have said that such costs either are unknown or may be as high as $8 billion for some plants.[100] Also, because full decontamination of a plant has never occurred, there are sure to be hidden, unexpected costs. These expenditures are likely to encourage greater risks (caused by efforts at cost control) and thus greater acceleration of decontamination expenses and risks.

In addition to the subjective and qualitative treatment of risks from contaminated groundwater and decommissioning, the Louisiana EIS underestimates health and safety risks in numerous other areas. The document ignores the cumulative effect of radiological releases by virtue of its failure to calculate actual probabilistic estimates for this risk and instead dismissing it.[101] Similarly, the EIS authors admit repeatedly that the facility may not be economical,[102] yet the document never provides any analysis of the way that uneconomical operations typically drive plant operators to take short cuts with respect to safety. Indeed, the admissions that the plant may be uneconomical should serve as a "red flag" to anyone who believes that operators are likely to follow regulations, particularly in a situation where there are limited profits to fund health and safety expenditures. The EIS admissions — that the plant "would operate under most.... scenarios" and that "operations would continue even if the plant cannot cover its fixed costs"[103] — suggest that past experience with safety violations at

98 1 EIS, at 2-54 & 2-55.

99 1 EIS, at 4-76.

100 *National Energy Strategy, supra* note 37, at 194.

101 1 EIS, at 4-69.

102 1 EIS, at 4-78 & 4-85.

103 1 EIS, at xxv, 4-78 & 4-85.

other U.S. nuclear facilities will be repeated at the LES plant. They also suggest that CEC operators will ignore environmental regulations in the face of uneconomical operations. Moreover, because the NRC will review the facility monitoring program only biennially, there is reason to believe that the EIS has underestimated probable health and safety risks. One wonders if the LES and the NRC would attempt to impose a marginally economical, risky facility on an affluent white community.

Underestimation of Costs and Overestimation of Benefits

While the EIS underestimates the risks and costs of the proposed facility, it overestimates and biases proposed benefits of the CEC. This overestimation and underestimation appears to be systematic in such a way as to prejudice readers in favor of the proposed plant. For example, in the EIS benefit-cost analysis for the CEC, assessors neither quantified and costed numerous consequences nor included them in the analysis. They minimized health effects, safety hazards, associated increases in crime and the worsening of the economic burdens on the lowest economic groups living nearby. Assessors briefly and qualitatively discussed such effects and then excluded them from the benefit-cost analysis. For example, the EIS estimates that potential radioactive doses from liquid releases will be two to ten times higher for children and infants than for adults[104] — and that the largest tissue doses from atmospheric releases (from the facility) for maximally exposed infants will be at least four times greater than for adults.[105] Yet its authors fail to include the costs and inequities associated with such effects. As a result, they systematically overestimate the facility's desirability.

Assessors likewise minimize cumulative costs associated with radiological pollution, including health and safety-related effects on the workers. They are omitted from the benefit-cost analysis, as are worst-case accidents. Such omissions clearly indicate both that the EIS is far below the standards of PRA typically employed to assess proposed U.S.

104 1 EIS, at 4-42 & 4-44.

105 1 EIS, at 4-41& 4-42.

facilities and that these omissions undercut EIS reliability. Despite all these increments of imposed risk — including the inequitable risk on infants and children and the absence of a threshold for radiation risk or damage — the benefit-cost calculations include no figures for the health effects of any radioactive pollution. Given the admission (mentioned earlier) that the plant may be unprofitable, EIS exclusion of broad classes of costs suggests that it may be even more massively uneconomical. Once one calculates the social costs of omitted inequities and environmental burdens, the rationale may become even more problematic. If owners and operators had to fight an affluent, nonminority community, it is obvious that total costs would make it prohibitive. Such economic considerations suggest that environmental racism may well have played a key role in plans to build the center.

Not only does the EIS appear to underestimate facility costs because of excluding many important economic, medical, environmental and social factors, but it also overestimates benefits. For example, it presupposes that economic benefits will flow from the CEC during its 30-year life, even though the U.S. commercial nuclear program actually came to a standstill in the mid-70s. If most U.S. reactors will have ended their useful life by the beginning of the next century, when the proposed facility will open, then it is questionable whether many economic benefits will flow from the plant. The EIS also is problematic in claims that many secondary economic benefits will arise from the infusion of wages and associated construction activity.[106] Assertions about secondary economic benefits may be invalid because most of the facility-related positive impacts will go to the middle, not the lower, economic classes.[107] On the negative side, as assessors recognize, crime will increase and property values will increase, but not in areas affected by drugs and crime.[108] If economic boons of the facility cause greater social inequities, then the "hidden economy" of

106 1 EIS, at 4-79 – 4-83.

107 1 EIS, at 4-78.

108 1 EIS, at 4-31, 4-79 & 4-83. *See also* Draft EIS, at 4-80.

the underworld may divert potential secondary benefits into crime rather than economic growth. In other words, if the regional economic infrastructure cannot use the *secondary economic benefits* associated with new construction and increased employment from the CEC, then criminal networks could divert these monies to create *secondary economic burdens.* Meanwhile the host community will need explicit and increased government expenditures in order to deal with problems that the CEC exacerbates. Because the NRC authors never quantified and included the additional and serious costs of drug trafficking, increased crime, exacerbated inequities and so on, the EIS has underestimated the social costs associated with the enrichment facility and overestimated alleged secondary economic benefits. Indeed, there may be an excess of secondary economic burdens. The presumed positive benefit-cost ratio in the EIS is the product of numerous qualitative, vague and subjective judgments. It is not the result of a comprehensive quantitative analysis. If the CEC induces extreme negative social impacts, then the authors ought not have used standard *multipliers* for secondary economic benefits. The economic consequences of the proposed facility may actually require the use of *divisors* for secondary economic benefits.

Apart from the alleged higher-order impacts of the proposed plant, many primary economic benefits said to come from it are highly questionable. For example, the Draft EIS asserts (without evidence and any quantification) that "for CEC most goods and services (excluding the centrifuges and related extremely specialized equipment) can probably be procured within the state."[109] If builders guaranteed that they would obtain, within the state, particular amounts of specific goods and services, then it would be reasonable to claim these benefits of the plant. Because there is no such guarantee in the EIS, such benefits are purely hypothetical. Moreover, the educational, social, financial and industrial problems of the region and the state could undercut many goods and services that the proposed facility might provide. It appears

[109] Draft EIS, at 4-75.

that economically and socially disenfranchised residents of Louisiana are being asked to bear the CEC burden of radiological damage, despite the questionable socioeconomic consequences of the facility.

Ethical Connections: Assessment Methods and Racism

Because the Louisiana EIS suffers from serious methodological and logical inadequacies, the attempt to use it to site the CEC installation is not justified. Given that minorities and socioeconomically disadvantaged communities would host the proposed facility, using the methodologically flawed and biased EIS as grounds for licensing the plant would result in unjustified discrimination against these hosts. In other words, the proposed siting of the facility is an example of environmental injustice and racist bias in environment-related decisionmaking. Environmental injustice occurs not only when policymakers explicitly violate minorities' rights to free informed consent or equal treatment but also when assessors employ biased, allegedly scientific methods whose consequences de facto result in discrimination against people of color or against socioeconomically disadvantaged groups. If the CEC assessment were not biased in some of the ways outlined earlier, it would be less likely that the document could be used to justify siting the facility in a poor minority community. The EIS conclusions thus appear racist and indefensible to the degree that they have increased the likelihood of an inequitable risk imposition. Using the EIS conclusions to justify this Louisiana site selection likewise seems less defensible to the degree that such a selection would not occur within an affluent white community. The EIS methods are more defensible to the extent that they are equally likely to be used, regardless of the racial and economic characteristics of the proposed host community. In other words, siting the Louisiana CEC appears to be racist and ethically unjustifiable to the degree that the biased assessment is designed precisely to sanction imposing an inequitable risk on a poor black community. The siting is unjustified to

the degree that assessment methods are not independent of whether the host community is black or white, poor or wealthy.

Of course, objectors could argue that the social and industrial agents — who are using a methodologically flawed assessment to justify siting the Louisiana enriched uranium facility — are not knowingly using a biased analysis that encourages racism and an inequitable risk burden. However, it is unlikely that the NRC assessors are unaware of the consequences of using a flawed EIS to site a dangerous facility in a poor minority community. For one thing, public controversy over anything related to radiation is well known, especially to people in the nuclear industry.[110] Hence, the NRC and the promoters of the Louisiana plant are unlikely to be strangers to radiation-related conflicts. Social scientists also have documented extensively the fact that it is more difficult to site risky facilities in wealthy than in poor areas.[111] Of course, if the actors involved in using the flawed assessment to promote the CEC are ignorant of these social-scientific data, then they may be innocent of environmental injustice or racism, even if their actions help impose inequitable and involuntary risks on a poor black community.[112] Even if the authors of the Louisiana EIS and the accident analysis are acting in ignorance of the racist consequences of their assessments, however, they may not be free from ethical responsibility. All scientists and researchers have duties to promote objectivity and to protect the public welfare.[113] They have obligations to know how to do research and how to conduct it without obvious bias. For example, they have duties to know how to eliminate

110 *See, e.g.,* National Research Council, **Building Consensus through Risk Assessment and Management of the Department of Energy's Environmental Remediation Program** (1994).

111 **Risk and Rationality**, *supra* note 76, at 72-74; Kristin S. Shrader-Frechette, **Science Policy, Ethics, and Economic Methodology** Ch. 7 (1984).

112 For discussions of consent in this case, *see* Daniel C. Wigley & Kristin S. Shrader-Frechette, *Consent, Equity, and Environmental Justice: A Louisiana Case Study,* in *Faces of Environmental Racism* (Laura Westra & Peter Wenz eds. 1995).

113 Kristin S. Shrader-Frechette, **Ethics of Scientific Research** Ch. 2–5 (1994) and **Ethical Issues in Scientific Research** (Edward Erwin, Sidney Gendin & Lowqell Kleiman eds. 1994).

or improve outmoded, deterministic models of accident analyses. They have duties not to do perfect research but to avoid the obvious flaws that almost any expert practitioner would recognize as poor science. In the Louisiana EIS, at best, assessors appear to have neglected their duties to use current research methods. If they have erred in this way, then they are at least partially responsible for the racist consequences that their assessments appear to condone.

Those who object to our thesis might also claim that flaws in the EIS are independent of the fact that the proposed host for the facility is a poor black community. In other words, they might object that sloppy science occurs everywhere, that there is no basis for believing it is intentional. On the contrary, the EIS bias and racism appear to be neither accidentally related nor independent. One reason is that, as we argued earlier, EIS assessors rejected potential sites for fallacious reasons and used outdated transportation calculations. The authors ignored more convenient facility sites (closer to distribution points and associated with cheaper transportation costs) that may have been in more affluent white communities. In disregarding locations that fit their own stated criteria, the assessors appear to have preferred a site in a disadvantaged area over one that more closely matched their claimed selection criteria. Also, as we argued above, investigators failed to choose host communities that satisfied stated criteria for site solicitation, scoring and evaluating. Moreover, as we have argued, assessors were able to underestimate the risks associated with the Homer facility because they used outmoded, 25-year old, qualitative, deterministic accident analysis. But both LES investigators and the authors of the assessment know that they have obligations to recognize or correct such flaws. After all, assessors have several decades of methodological "know how" behind them. Since at least 1970, scientists have been preparing and defending EISs and risk analyses. NEPA and its EIS requirements are 26 years old. Those involved in environmental impact assessment and PRA, especially in controversial

areas of technology, can implement state-of-the-art assessments.[114] For all these reasons, use of several outdated procedures does not appear typical. Therefore, there seems to be dependence between assessment bias and the attempt to site a facility in a poor black community. By failing to follow their own site-selection norms, assessors reveal the dependence between their biased analyses and siting the facility in a minority community. Further, it is unlikely that they would try to use outmoded deterministic techniques in an EIS for a facility near an urban, affluent, white area. Corporate managers, at least, know that well-to-do residents (or their attorneys) are well aware of the legal PRA standards. Indeed, PRA — not deterministic analysis — has been the norm at least since 1983 and the famous risk assessment "Redbook."[115] Given established PRA and EIS standards, failure to follow them suggests more than accident or ignorance.

If our analysis is correct, then EIS authors and agents promoting the facility are acting neither innocently nor ignorantly by helping to impose a serious risk on a poor black community. Consequently, they appear to be behaving in a reprehensible way for at least three fundamental ethical reasons: Might does not make right; the end does not justify the means; and site promoters err in proposing the facility under conditions that violate traditional standards of procedural justice. We discuss each in order.

Actions are ethically justifiable because they are in accord with justice, recognized duties or the greater good. They are not justifiable merely because some people — like those attempting to site the CEC facility — are able to overpower others or to take advantage of them. Because moral and legal rights to equal protection are not contingent on socioeconomic status or power, those who employ flawed assessments (either knowingly or through culpable ignorance) are responsible for consequences of environmental injustice. They are accountable

114 National Research Council, **Improving Risk Communication** Ch. 3, 6 & 7 (1989).

115 *See, e.g.,* National Research Council, **Risk Assessment in the Federal Government** (1983).

whenever their analyses help to sanction inequitable risk impositions on people who are less able than others to resist the imposition. Taking advantage of those less able to defend their rights is never morally acceptable. Indeed, if it were defensible, then might would be right, and there would be neither ethics nor law but only the ability of the powerful to prey on the powerless.

Proponents of the facility might object, of course, that the plant will bring economic benefits to the country and the region as a whole. They might say that this "greater good" justifies any apparent inequities. In other words, CEC advocates might claim that the end justifies the means. Such an argument is problematic for at least four reasons. First, we showed that because there is no clear need for the facility, its economic benefits are likely to be illusory. Second, we argued that the proposed technology is not "state of the art" and indeed is likely to harm U.S. interests. Third, we indicated that because the assessment underestimates costs and overestimates benefits, the facility may well be an uneconomical operation in which site managers "cut corners." All three reasons suggest that, even on purely economic and political criteria, the CEC is not likely to lead to the greater good or important economic benefits. Of course, it may benefit the multinational corporation and its shareholders who control LES. Benefitting them at the expense of citizens (whose DOE uses more advanced uranium enrichment technology), however, is hardly a greater good. Hence, it is difficult to argue that the end (corporate benefits) justifies the means (inequitable risk imposition). The end does not appear to promote what is good for the majority of citizens. But even if the end (siting the facility) were good for the greatest number of people, this fact might not justify promoting the CEC. If black Louisianans' rights to equal treatment could be compromised whenever the majority might benefit, then there would be no moral rights at all. Rights would be only a matter of expediency, something to be granted when convenient. But moral and legal rights are not matters of expediency. Citizens in

impoverished, rural or black communities have as much right to equal consideration as those in wealthy, urban or white communities. Thus, it is not ethically justifiable to sacrifice minorities' or poor people's basic moral rights — without their consent or compensation — for the good of the whole.

If assessors and promoters are acting in neither innocence nor ignorance by using a flawed assessment to encourage the imposition of inequitable risk on a poor black community, then they also appear to be behaving unethically, in part because Claiborne Parish citizens probably have fewer resources than others to detect flaws in the assessments. To the degree that socioeconomic deprivation and racism keep them from recognizing and protecting their interests, then biased assessments and site-selection procedures contribute to violations of procedural justice. (Procedural justice specifies legitimate procedures by which transactions among people take place; the procedures must be fair, avoid cheating or stealing, and so on.[116]) Because the assessment includes so many methodological flaws that help to sanction siting the facility, and because local residents likely are less able (than persons in more privileged communities) to recognize such flaws, the EIS procedures violate standards of procedural justice. And if they violate standards of procedural justice at the expense of minorities, then promoters appear to violate ethics in helping to create a situation of environmental racism.

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116 *See* Robert Nozick, **Anarchy, State, and Utopia** (1974); John Rawls, **A Theory of Justice** 86 (1971) and Lynton K. Caldwell & Kristin S. Shrader-Frechette, **Policy for Land** Ch. 6 (1993).

Conclusion

We conclude that the NRC's EIS fails in at least seven respects and all contribute to inequitable imposition of risks on a black community:

- It provides inadequate arguments showing the need for the enrichment plant, as required by NEPA, and for siting it in a poor black community.
- The NRC does not sufficiently explore other, less dangerous energy alternatives.
- It gives no reasonable justification for eliminating potential alternative sites in more affluent, white areas.
- It ignores the consent of the proposed black host community by using inconsistent criteria for site selection.
- The NRC utilizes biased accident evaluations that underestimate risks imposed on the black community.
- It minimizes and misrepresents normal operating risks of the facility.
- The EIS underestimates the costs and overestimates the benefits of the enrichment center.

Because the EIS falls victim to all these flaws, and because the assessors likely are neither innocent nor ignorant regarding the contribution of these errors to imposing an inequitable risk on a poor black community, we conclude that the CEC assessment contributes to environmental racism.